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KS 2110-6 (2009) (English): CCTV surveillance
systems for use in security applications Part 6:
Maintenance requirements (Draft Standard)

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KENYA STANDARD KS 2110-5:2009

CCTV surveillance systems for use in security applications — Part 6: Maintenance requirements

PUBLIC REVIEW DRAFT,MARCH 2009

First Edition, 2009

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Associated Battery Manufacturers
Kenya Railways Corporation
Securicor Alarms (K) Ltd.
Department of Defence
Ministry of Roads and Public Works
Kenya Power & Lighting Company Ltd.
Automotive Industrial Battery Manufacturers (A.I.B.M) (K) Ltd**.**
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Foreword

This Kenya Standard was developed by the Technical Committee on Extra-low Voltage and is in accordance with the procedures of the Bureau.

In the preparation of this Kenya Standard, reference was made to SANS 10222-5-1-5:2003.

Acknowledgement is hereby made for assistance derived from this source.

KENYA STANDARD **KS 2110-5:2009**

CCTV surveillance systems for use in security applications — Part 6: Maintenance requirements

1 Scope

This standard gives recommendations for the maintenance of closed circuit television (CCTV) equipment comprising camera(s), monitor(s), video recorder(s), switching control and ancillary equipment for use in security applications.

The objectives of this standard are:

a) To provide guidance to the suppliers or contractors and end-users of CCTV systems in respect of the maintenance requirements necessary to derive maximum benefit from a CCTV-installation;

b) To provide an overview of the maintenance documentation requirements; and

c) To provide an overview of the *what* and *how* of maintenance checks.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below. Information on currently valid national and international standards can be obtained from Kenya Bureau of Standards.

KS 2110-1- *Installation and remote monitoring of detector activated CCTV systems- code of practice*

KS 2110-2 – *CCTV surveillance systems for use in security applications – Operational requirements*.

KS 2110-3– *CCTV surveillance systems for use in security applications – System design requirements*.

KS 2110-4– *CCTV surveillance systems for use in security applications –installation, planning and implementation requirements.*

KS 2110-5– *CCTV surveillance systems for use in security applications – Testing, commissioning and handover requirements*.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this standard, the following definitions apply:

3.1.1
Angle of view
The maximum scene angle that can be seen through a lens or optical assembly, usually described in degrees for horizontal, vertical or circular dimension

3.1.2
CCTV camera
Unit containing an imaging device producing a video signal from an optical image

3.1.3
CCTV camera equipment
Unit containing a CCTV camera plus appropriate lens and necessary ancillary equipment

3.1.4
CCTV control unit
Equipment for controlling and monitoring the required operational functions of the CCTV system

3.1.5
CCTV surveillance installation
Installation consisting of the hardware and software components of a CCTV surveillance system, fully installed and operational for monitoring a defined security zone

3.1.6
CCTV surveillance system
System consisting of camera equipment, monitoring and associated equipment for transmission and controlling purposes, which may be necessary for the surveillance of a defined security zone

3.1.7
Focus
Adjustment of the camera lens so that the image is sharp

3.1.8
Iris
Variable-aperture mechanism that regulates the amount of light that passes through the lens onto the imaging device of the CCTV camera

3.1.9
Lens
Optical device for projecting an image of a desired scene onto the photosensitive surface of the imaging device

3.1.10
Operational requirement
Statement of needs based on a thorough and systematic assessment of the problems to be solved and the hope for solutions

3.1.11
Picture storage
Storing of video images

3.1.12
Preset shot
Function in pan-and-tilt camera units or zoom lenses (or both) that allows automatic return to one or more predetermined positions

3.1.13
Time and date generator
Device for generating the time and date and incorporating them into the image

3.1.14
Time-lapse recording
Periodical recording of video signals at predefined intervals

3.1.15
Time multiplex recording
Method for recording several video signals on one video channel by time multiplexing the frames of Those video signals

3.1.16
Variable focal length lens
Lens with adjustable focal length in which the image does not remain in focus as the focal length Changes

3.1.17
Video matrix
Unit for connecting several input video signals to several outputs

3.1.18
Video monitor

Device for converting video signals into pictures on a display screen

3.1.19
Video motion detection
Method of detecting movement in the view of the camera by electronic analysis of the change in picture contrast

3.1.20
Video switcher
Unit for switching a number of video input signals to one or more outputs manually or automatically or on receipt of an external signal

3.1.21
Zoom lens
Lens with adjustable focal length in which the image of the scene remains in focus as the focal ength is changed

3.2 Abbreviations

For the purposes of this standard, the following abbreviations apply:

3.2.1 AC	alternating current
3.2.2 BNC	bayonet nut connector
3.2.3 CCTV	closed circuit television
3.2.4 PTZ	pan/tilt/zoom
3.2.5 UPS	uninterruptible power supply
3.2.6 VAC	volts alternating current
3.2.7 VCR\VR	video cassette recorder \video recorder.
3.2.8 VHS	video home system

4. Overview

The CCTV system shall be maintained periodically in accordance with the equipment manufacturers' recommendations and any specific requirements of the end-user. This has the potential benefit of prolonging the life of the system and minimizing the frequency and severity of breakdowns, while allowing maintenance expenditures to be planned rather than being incurred unexpectedly. CCTV systems consist of sensitive electrical and mechanical components which, when in use, are exposed to extremes of environment which could include temperatures ranging from below freezing to in excess of fifty degrees, wind, rain and hail. Systems located in coastal regions have to contend with the additional problem of corrosion due to saline atmospheres.

5. Maintenance

5.1 General

It is recommended that the CCTV contractor provide a maintenance plan that details the tests to be undertaken, a recommended list and quantities of spares to be held, the service periods, and special test instruments and tools required. This information will form part of any maintenance agreement to be concluded between the end-user and the relevant contractor – often referred to as the "service provider". The term "maintenance" relates to two basic types, namely, preventative and breakdown maintenance. Two other maintenance terms often referred to, are first-line maintenance and second-line maintenance.

5.2 Preventative maintenance

5.2.1 Preventative maintenance is the regular servicing of the CCTV system. It is sometimes referred to as routine maintenance or service. Routine visits shall be made on a scheduled basis at a frequency dependent on the environment, quality of the system components, and the system duty cycle, all of which affect the nature and severity of the wear on the system during usage. Maintenance routines shall include all of the operations as detailed in the typical maintenance schedule forming part of this standard.

5.2.2 It is difficult to be specific in terms of a recommended frequency for preventative maintenance visits. This will depend on factors such as the working environment, the security sensitivity of the area under surveillance, the number of VCRs (with their moving mechanical parts) and the period they are required to record, etc. VCRs could be required to record for as much as 24 h a day for 7 d a week or, conversely, only during after-hours for security reasons.

5.2.3 A CCTV system installed in a typical internal area (such as an office building), in a relatively clean environment could be serviced safely twice or three times a year. Whereas in a dusty and dirty working environment, the maintenance requirements could mean that visits would have to be increased to at least four times a year. As a general guideline, a visit once every four months should be adequate for most CCTV systems.

5.3 Breakdown maintenance

5.3.1 Even with regular preventative maintenance visits, equipment can still fail, requiring the calling out of the maintenance technician. This type of call-out is generally referred to as breakdown or emergency maintenance. Depending on the situation, the breakdown might require an immediate response, or a longer response time could be agreed with the end-user (for example, the response to a problem within 48 h). The problem could be the loss of the video signal from a general-purpose camera that does not seriously downgrade the overall effectiveness of the system, whereas total loss of the CCTV system recording capability could require a quicker response time such as within 4 h to 8 h.

5.3.2 As is the case with most sophisticated electro-mechanical systems, it is likely that “teething problems” (requiring repair) will be encountered with a new CCTV system. These might persist for some months, especially for large installations. In this event, it is important to thoroughly document problems in order that they can be analyzed to establish possible weaknesses in the design and operation of the system. This information is invaluable not only to improve an existing system but also to assist in the improved design of future CCTV systems.

5.3.3 The most unpredictable of all breakdown maintenance problems, associated with CCTV systems, is that of vandalism. The positioning of CCTV components should therefore, to some extent, consider the likelihood of vandalism as part of the system design process.

5.3.4 Irrespective of the cause of any given problem, it is important for the end-user to agree on all call-out response times with the contractor for breakdown maintenance. This shall be done based on the definition of the level of emergency (response time) and the description of the work to be performed.

5.4 First-line maintenance

First-line maintenance generally refers to the localizing of a fault to a modular (or board) level. The end-user’s own staff would normally undertake this process. The faulty module is then returned for repair, to another facility, where a higher level of knowledge and skills is available (for example, to the CCTV contractor or the actual equipment supplier). In cases where the end-user has staff on site to provide first-line maintenance, it is recommended that the contractor provide such training as part of his installation contract and that the technical documentation include a fault-finding flow chart to assist in localizing the fault at the required modular level.

5.5 Second-line maintenance

Second-line maintenance refers to fault finding at component level. That is, actually repairing the module or board. In cases where the end-user has skilled staff on site to provide such maintenance, it is recommended that the supplier provide such training. It may be necessary for the end-user’s staff to receive training at the premises of the equipment manufacturer. In certain cases, this will include a trip overseas, which may be prohibitive due to the costs.

6 Maintenance agreements

6.1 General

6.1.1 On completion of the installation, the contractor shall normally provide a 12-month guarantee period for the entire installation, as described in the works information of the contract. The guarantee shall cover all parts, spares and equipment that become defective during the guarantee period and ensure their replacement. It shall, in addition, cover all costs including material, labour, overheads and travelling, etc. The guarantee shall also cover the installation (often termed “the works”) against defects, whether patent or latent, as well as faulty materials and workmanship. Once this guarantee period has expired, it is recommended that the end-user enters into some form of maintenance agreement with either the original installer of the CCTV system or some other reputable CCTV company that can provide the necessary maintenance service.

6.1.2 The value of a maintenance agreement normally only becomes apparent in the years following the initial 12-month guarantee period, as components within the system age and fail due to wear and tear. Even during the guarantee period, it is still important not to ignore the preventative maintenance requirements of the system (the guarantee will not normally cover routine servicing of the system) as costs may otherwise increase dramatically in later years. Maintenance agreements are generally structured in one of two ways, namely:

a) Comprehensive cover – where a yearly fee (normally divided into 12 equal monthly payments) will cover all scheduled preventative maintenance, as well as all breakdown maintenance, both inclusive of parts and labour. Costs are fairly high but can be fixed for up to a five year period. This approach is ideal for operators who need to define their budget in advance; and

b) Incident-based cover – here the agreement normally takes the form of a fixed price for preventative maintenance cover together with payment at an agreed schedule of rates for labour and travelling for breakdown maintenance call-outs. In addition, an agreed percentage mark-up on spare parts, and in some instances materials, is also included.

6.1.3 For the CCTV company, a well-structured maintenance agreement can generate revenue, reduce service calls and, more importantly, retain end-users’ loyalty by generating confidence in the long-term support and reliability of the CCTV system.

6.2 Contents of the maintenance agreement

6.2.1 All companies offering a CCTV maintenance service provide their own form of a legal agreement or document. Unfortunately, the terms and conditions of such document tend to favour the CCTV Company and not the needs of the end-user (or “client”). It is therefore recommended that the end-user should draw up the agreement or at least ensure that, as a minimum, the service provider shall include the following clauses in his document:

a) Interpretation of the agreement – this provides an explanation of the context of the agreement;

b) Definitions – this is an important clause as it states clearly the meaning of the terms used in the agreement to avoid misunderstanding, especially when a dispute arises;

c) Duration of the agreement – this clause will provide the date of commencement, the initial period of the agreement, subsequent renewal conditions and the notice period to terminate the agreement once the initial period has lapsed;

d) Obligations of the service provider – this clause entails what is expected of the service provider under the agreement. For example, the notice required to be given to the client before commencing routine service, response periods for breakdown call-outs, the handling of additional repairs that do not fall within the scope of the normal servicing or repair requirements, completion of the system or equipment log book, the work to be carried out (this is normally stipulated in separate schedules), completion of service reports (again the requirements would be detailed in a separate schedule), etc;

e) Obligations of the client (end-user) – this clause will detail the client’s obligations in terms of the agreement and will cover such items as reasonable access to the premises, the provision of electricity necessary to carry out the work, and the issuing of instructions to the service provider;

f) Working hours – this clause will define the specific times that the service provider may work at the premises of the client. The handling of breakdown maintenance call-outs, such as contact telephone numbers, contact addresses, to allow the client to make emergency calls, should also be provided;

g) Indemnity and insurance – the service provider shall indemnify the client against defined liabilities. The service provider shall also be expected to be adequately insured in respect of public liability, common law liability, workman's compensation, etc;

h) Guarantee of workmanship – this clause shall provide a guarantee for any item of equipment forming part of the CCTV system which has been repaired, overhauled, refurbished, serviced or worked on by the service provider that becomes defective or faulty during the specified guarantee period;

i) Legislation conditions – all the work carried out by the service provider shall comply with laws, by-laws, ordinances or statutes which are applicable to any actions of the service provider in terms of the agreement.

j) Price and payment conditions – this heading is self-evident. Some form of price adjustments may be agreed upon, especially for long-term agreements. If so, the method for escalating the prices shall be detailed as part of this clause. Prices for the larger, more complex systems, which may include other related security equipment, should be detailed in separate pricing schedules. CCTV systems are very often used as part of an integrated security system that could include: access control, alarm detection, metal detectors, X-ray machines, and mechanical items (e.g. turnstiles and "mantrap" booths), etc. The maintenance requirements for the CCTV system would then form part of the overall maintenance agreement;

k) Breach of the agreement – this clause details the action to be taken should the service provider fail to fulfil any obligations or should the work not be completed with due diligence and in a proper workmanlike manner to the satisfaction of the client;

l) Resolution of disputes – this clause details how disagreements between the service provider and the client shall be handled;

m) General – this clause will detail various other provisions of the agreement that are not covered by any other clause, such as: variations, alterations, or consensual cancellation, confidentiality requirements, and indirect or consequential loss, etc; and

n) Domicilia and notices – this clause states the chosen physical addresses (not a Post Office box number) of the two parties to the agreement for the purpose of sending notices. It will also state the delivery details that will constitute correct delivery of the notices.

6.2.2 As indicated in the previous paragraph, items such as a list of equipment, work to be carried out, prices, rate prices for breakdown repairs and call-outs, and service sheets and reports to be submitted shall be contained in specific schedules that form part of the maintenance agreement. It should be noted that a maintenance agreement for smaller, stand-alone CCTV systems would, in all probability, include the information contained in these schedules (because of the reduced amount of such information), in the main body of the agreement. The following examples of schedules that could be included in a maintenance agreement are not definitive and should only be used as a guideline. The actual maintenance requirements of the end-user shall determine the details (for example, the service period). This may be quarterly as in the example, or half yearly depending on the circumstances. The schedule of work could also cover more (or less) inspection checks or tests (or both).

6.2.2.1 Schedule of equipment – Schedule A

The schedule of equipment to be maintained for a typical integrated security system shall be as follows:

- CCTV System.
- Alarm System.
- Access-control Booths, Revolving Doors and Selector (i.e. anti-hostage) Doors.
- Any other item of equipment or system that may be added from time to time.

6.2.2.2Schedule of work – Schedule B

a) The schedule of work to be carried out could be as simple as:

- Inspect regularly and systematically, at four-monthly intervals.

- Replace all defective components.
- Inspect and clean on a four-monthly basis.
- Service the mechanism of mechanical devices.

or

b) For a specific CCTV system:

- Test operation of the CCTV cameras.
- Test operation of the CCTV monitors.
- Clean and adjust all CCTV camera lenses.
- Clean and adjust all CCTV monitors.
- Clean and test the operation of all video recorders.
- Clean and test operation of multiplexers.
- Check the camera power supplies on cameras not connected to the main supply.
- Visually inspect the condition of the coaxial cable.
- Ensure that all switches are returned to their normal operating position.
- Make a note in the logbook of any circuits that are subject to repair, alteration, or extension.

6.2.2.3 Summary of prices – Schedule C1

This price schedule shall include all services and requirements as set out in schedule B.

6.2.2.4 Labour rates for repairs and emergency call-outs – Schedule C2

This schedule shall include the labour rates for normal working hours (for example from 08:00 to 17:00); weekday overtime, Saturday overtime, Sunday and public holiday overtime. The rates would vary for the different grades of workers involved – technicians or unskilled assistants.

In addition, the schedule shall normally include travelling expenses at a rate of Kenya Shilling per kilometre and possibly a percentage mark-up on the cost of spares and materials.

6.2.2.5 Requirements for service sheets and reports – Schedule D

This schedule shall specify the information required in terms of service sheets and reports for breakdown call-outs. For example:

a) Service sheet – this provides details of the expenses incurred in carrying out the repairs.

- Name of building or site (if more than one is involved).
- Details of work undertaken.
- Hours taken to carry out the work.
- Hours taken travelling to and from the site.
- Distance travelled in kilometres.
- Date.

- Maintenance person’s signature.
- Signature of end-users’ representative.
- Works authority reference.

b) Report – this provides additional information with respect to the work carried out in a breakdown maintenance call-out situation or as a result of a normal preventative maintenance visit.

- Name of building or site.
- Site address (if applicable).
- Date the work was carried out.
- Works authority reference.
- Routine or non-routine maintenance.
- Details of the work carried out.
- Details of items requiring attention.
- Details of any proposed recommendations or improvements.
- Details of costs to implement the recommendation listed above.

6.2.2.6 Special conditions – Schedule E

This schedule shall detail any conditions that would take precedence over any clause contained in the standard maintenance agreement. For example, should the equipment become under- utilized or idle (for whatever reason) such that the operational maintenance requirements are reduced, then a suitable reduced scope of maintenance work shall be agreed between the two parties to the agreement, with the corresponding reduction in the prices.

6.3 Costing the maintenance agreement

6.3.1 The basic costing of maintenance agreements is fairly easy to determine, as it usually depends on the known operating costs of the particular CCTV Company. However, there might be many hidden costs, which are often overlooked. The following queries need to be addressed, as the answers could significantly increase the overall costing of the final maintenance agreement:

a) What is the response period required by the client? For example, eight hours or less?

b) Does the end-user require 24-hour service in case of essential equipment failures?

c) Are all video equipment accessible using standard ladders or is there a requirement for special apparatus such as extended ladders, scaffolding, or a cherry picker?

d) Is a two-man operation of the above apparatus required?

e) Does the site require supervision by a dedicated site official representing the end-user?

f) Does the end-user require that special equipment, such as intrinsically safe tools, be used?

g) Are there any time-consuming procedures that need to be adhered to (a requirement of most mining establishments)?

h) Is the site in a dusty or dirty environment requiring extra maintenance visits for equipment such as video recorders, etc?

i) Does the client require the holding of standby stock such as cameras, VCRs, and pan/tilt units?
j) Is the contractor liable for lightning damage?

6.3.2 Equipping the CCTV maintenance staff is also a cost that needs to be considered. The labour and travel cost (provision of a vehicle and running cost, etc.) shall be known, as it should form part of the company operating cost. The standard tool-kit carried by the CCTV company's personnel shall also form part of the operating costs. However, maintenance personnel will need additional equipment and this needs to be factored into the cost calculation.

7 Maintenance tool-kit and equipment

7.1 Standard tool-kit

The following list is a minimum recommendation for the tools that should be carried by maintenance personnel in order to undertake repairs and maintain most types of CCTV systems.

-Selection of screwdrivers (Philips, Posidrive, Terminal)
-Combination pliers (insulated)
-Side cutters (insulated)
-Wire strippers
-Shifting spanner
-Selection of suitable spanners
-Hacksaw and blades
-Stanley knife
-Large and small hammers
-Set of Allen keys
-BNC crimping tool
-Spirit level
-Plumb line
-Crimping tool(s)
-Soldering iron(s) – electric and/or gas
-Solder sucker
-Electric drill and extension lead
-Selection of steel and masonry drills
-Hammer
-Centre punch
-Flashlight
-Lead light
-Selection of coaxial fly leads
-Suitable multimeter.
-Ladder (minimum 7 step)

7.2 Additional equipment

In addition to the standard tool-kit, maintenance personnel shall also carry cleaning equipment, lens tissues, a head cleaning kit for VCRs and any consumable spares such as fuses, screws, infrared light bulbs and video tapes. An infrared lens or neutral density filter is useful for setting night focus during daylight hours. Video isolation transformers can eliminate hum loops and a silicone gun is necessary for sealing outdoor junction boxes, etc. Useful extras to carry are: an oscilloscope for checking video levels; a hand-held focus adjuster; a portable CCTV monitor for setting up cameras at their individual locations, and an appropriate test target for objective checking of the camera views. A first-aid kit shall always be included in any tool-kit.

8 Handling of faults

8.1 The CCTV operator or the appointed representative of the end-user shall be responsible for reporting faults with the CCTV system in terms of the breakdown maintenance agreement. The representative shall contact the CCTV maintenance company, telephonically or via a faxed fault report document and supply the following information:

a) Client name and address;

b) Date and time of report; and

c) Identification of the fault with a short explanation.

NOTE In case of a telephonic report a follow-up fax, giving the above details, should be sent to the CCTV Company.

8.2 The CCTV company shall confirm receipt of the fault report by supplying the end-user's representative with a fault reference number.

8.3 A docket, detailing the above information, shall be prepared for the maintenance person attending the fault. On rectification of the problem or fault, the technician shall endorse the relevant section of the form, with details of the action taken together with the date and time of the repair. The end-user's representative shall then be asked to sign the form as acknowledgement that he is satisfied with the work carried out.

8.4 All fault documentation shall be stored in a relevant customer file for safekeeping.

9 Maintenance checks

9.1 General

What needs to be checked or inspected and how to check it is very much system-dependent and maintenance of a system installed today can be very different to one installed five years ago. As equipment has radically changed over the last few years, maintenance is currently more economical to perform than it used to be.

9.2 System maintenance logbook

A system maintenance logbook shall be provided at each CCTV installation to provide a record of each visit and what transpired. The logbook shall include the following information:

- Date of the visit.
- Reason for visit – preventative or breakdown.
- Defects, faults or failures found and the reason for them.
- Extended or prolonged breakdowns and the reasons for them.

- Repairs carried out.
- Time involved.
- Name of the person attending to such problems or inspections (or both).
- Any other data or information that might be required by the end-user.

9.3 System maintenance

It is advisable to check that the types and location of the various items of equipment constituting the CCTV system are still as originally installed and that no changes have occurred since the last maintenance visit. The following checks are not exhaustive but provide a general guide to maintaining the quality of a CCTV system.

9.3.1 General system checks

As a general system check, the following shall be implemented:

a) Check the satisfactory operation of the system from the control room equipment to ensure that every function and view is as originally designed and that no significant performance changes have taken place. If equipment operation is different after hours, then this mode should also be checked;

b) Check where appropriate, that the normal and standby power is functioning correctly. Check batteries where applicable;

c) Check that the uninterrupted power supply (if installed) is capable of carrying the system under full load when the mains supply has failed;

d) Check common low voltage power supplies for the correct output level when fully loaded;

e) Check cabling. This is often a neglected area of the system. Sometimes very cheap cable is used and if the cable length is excessive, its subsequent deterioration shall adversely affect the resolution. Damage to cables can often result in shadows or echoes on the monitor picture. If the cabling is suspected of being the cause of poor picture quality, check as follows:

- Check that the inputs of the cables are terminated at 75 Ω.
- Check all cable terminations for continuity and correct earthing.
- Check for mechanical damage.
- Check for corrosion of the cable due to ingress of water, especially if it runs underground.
- Check security of the fixings of the cable.
- Check for vermin damage. Rats can cause problems by gnawing cables.

f) Check that all luminaries associated with the system are operational. If infrared spot lamps are mounted on PTZ units, verify that the area of illumination and the camera's zoomed-in field of view correspond; and

g) Enter the results of these checks (and the following equipment checks) into the system maintenance logbook.

9.3.2 Individual equipment checks

As part of the preventative maintenance requirement, visual and functional checks of all parts of the CCTV installation shall be undertaken. Where visual tests cover the standard of workmanship of the installation, the functional quality of the various system components and their compliance with the system specification shall be checked. Functional tests include checking the functional compatibility of the components of the installation. A list of typical checks that shall be carried out on individual items of equipment is given below:

- Cameras and lenses:
- Clean the cameras and lenses.

- Check cable connections.

- Check power supply voltages for cameras not connected to the 230 VAC mains supply.

- Check the focus and iris settings and if the lens is easily accessible, then lock the focus and iris with adhesive tape to prevent inadvertent or deliberate interference.

- Check the lens angles of view to ensure they still apply to the design criteria.

- Check the operation of auto irises.

- Check the preset operation of zoom lenses if required. If the camera has to cope with a wide range of light conditions, a neutral density filter shall be fitted in order to set the focus at the maximum lens aperture.

b) Monitors

- Clean the external housing.

- Clean the face of the monitor with anti-static cleaner.

- Check for noisy controls; the high voltage present across the contrast control of some monitors may cause problems.

- Check the resolution of the monitor, the tube might have gone soft. This is seen as a loss of focus and may be accompanied by a lack of screen brightness. At one time, it was economical to change the monitor tube but, nowadays, it may well be cheaper to change the monitor.

- Reset the contrast and brightness controls if necessary.

c) Fibre optic transmitters (if installed)

- Check for correct maximum input/output levels on all channels.

- Check for correct video/telemetry/data transmissions.

d) Telemetry controllers

- Check operation for pan, tilt, and preset (if applicable)

- Check control cable connections.

e) Pan, tilt and zoom units (PTZ)

- Check that the end stops are correctly positioned and not loose. Loss of an end stop shall cause the unit to gradually strangle itself on its own cable.

- Check status of camera load-bearing connectors; tighten, or replace fixings, as necessary.

- Check all cables and connections for any sign of wear and for any water seepage into the fittings, plugs or sockets. That is, check all seals.

- Check mechanical fixings to the building infrastructure for corrosion, wear, and rigidity.

- Check for smooth operation and that no backlash is evident.

- It is advisable to avoid constant patrols from automated systems as these will unduly stress the unit head and result in extra maintenance.

f) Camera housings and brackets

- Check housing for corrosion.
- Clean faceplates.
- Check cable entry glands and repair or replace as necessary.
- Check interior for any insect or rodent infestation and eliminate. If infestation is a problem then leave a block of insecticide inside the housing to discourage further visitors.
- Check mechanical fixings to the building infrastructure for corrosion, wear, and rigidity.
- Check status of camera load-bearing connectors, tighten, or replace fixings, as necessary.

g) Video recorders\ Video cassette recorders (VCR).

Video recorders can be very mechanically intensive devices and, as such, needs regular attention.

- Clean both internally and externally.
- Clean all rotating and moving parts.
- Lubricate moving parts where applicable.
- Clean all tape transporters and pick-up heads.
- Check the condition of the tension band unit and all idlers.
- Check the correct time and date on the VCR and synchronize all other VCR clocks (if applicable) to the same data. Should the system use a multiplexer(s), then the VCR display(s) and the multiplexer display used to record the correct date and time shall be disabled. It is essential for evidential purposes that only one date and time appear on the recording and that this data is as accurate as possible.
- Perform a functional test on the VCR, including reviewing the recording of the tape made after the service. This will normally entail checking recordings made in the time-lapse mode. A video recording of all cameras is recommended after completion of each system service. This shall enable a record to be kept for comparison purposes between one visit and the next. It shall also demonstrate to the end-user the quality of the CCTV system at the time of the service, should a query or dispute arise at a later stage.

It is advisable to complete the service as per the manufacturer's instruction. Reputable manufacturers will supply refurbishment kits that include drive belts, idler wheels, etc. New sets of heads are relatively inexpensive and should be changed on a regular basis (see manufacturer's servicing instructions for details) and not just cleaned continuously at each preventative visit. VCR tapes should only be used for a maximum of 12 times (i.e. 12 complete passes).

If, for example, archiving of videotapes is required for a month, then a total of 31 tapes would be required to cover a 12-month period. That is one tape for each day of the month that would be used 12 times for the year. These tapes would be replaced by new ones for the next year. Likewise, three-month archiving would require 93 tapes; these would be replaced after three years.

h) Motorized dome cameras

These units tend to be very reliable but once again, constant patrols might reduce the expected life of the unit. Despite the reliability aspect, the following basic checks shall still be carried out.

- Check operation of the unit.
- Check that the unit can recall preset positions.

- Check and clean glass.
- Check that all fixings are tight.

i) Switches, matrixes and multiplexers

These types of equipment are possibly the most maintenance-free parts of any CCTV system. It is unlikely that the images passing through these devices will degrade over time. Only the following operating checks need to be undertaken.

- Check all video connections.
- Verify that all keys/push buttons are operational.
- Check that joystick controls operate in all directions.
- Functionally test the multiplexer, including real time and time-lapse modes.
- Ensure that the correct date and time are displayed and that all other similar units are synchronized to the same data.

j) Video motion detection

Check that this function is still operating in terms of the operational requirement. This can be achieved by carrying out some or all of the following tests, depending on the objective of the system. This shall often depend on the security sensitivity of the area being protected.

- Walking at a normal pace – this would test the system in the case where the intruder is unaware of the detection system.
- Running – this tests the response of the timing algorithms.
- Head rolling – this is a very fast small area target.
- Paused walk – this tests the pre-alarm and detection algorithms.
- Slow walk – this enables the set-up to be refined.
- Crawling – this would represent a small target on hands and knees.
- Body dragging – this represents the smallest target area and the slowest speed.

10. Documentation

10.1 Operation and maintenance manuals

Documentation is possibly the most common problem found at all CCTV installations. It is normally poor in quality or non-existent. Irrespective of the type of information required, the principle of concise, complete, and unambiguous information shall apply. The information provided in the operation and maintenance manuals shall be of great benefit to maintenance personnel. The manuals shall be properly indexed to facilitate easy reference and shall contain the following information:

a) A list of spares to be supplied by the contractor (installer) to cover the period of maintenance.
This list shall cover all spares to be held in stock by the contractor for the CCTV installation and shall not, in any way, relieve the contractor of the obligation to provide all spares required during the maintenance period;

b) A list of the name(s) and address(es) of the local agent(s) for each item of equipment;
c) A list of the name and address of the manufacturer of each item of equipment;
d) A copy of all test certificates obtained with the system;
e) A preventative maintenance programme for all equipment;
f) Operating instructions for each item of equipment;

g) Complete “As built” drawings of the installation and wiring and schematic diagrams;
h) Detailed operating instructions for all the modes of operation of the system;
i) Acceptance document; and
j) Test and commissioning data sheets.

10.2 Maintenance specific documentation

Apart from the normal operation and maintenance manuals provided, it is essential to establish maintenance documentation of the CCTV system and its component parts. Details of the fault report document and system maintenance logbook have been provided in 8.1 and 9.2, respectively. In addition to these documents, it will be necessary to generate a maintenance record of the individual items of equipment constituting the system. This equipment record should record the end-user’s details, and the details of each item of equipment. Equipment maintenance records shall be duplicated for use at both the site and the office of the contractor and shall be kept in a safe place.

Generic information required on the equipment record shall be:
a) Equipment manufacturer’s name;

b) Equipment model and serial number;

c) Location (or position) in the system; and

d) Any other relevant information.

For each item of equipment, there shall be a comprehensive record giving the date of every visit, the fault found, and the action taken. The record shall also indicate the date of each temporary disconnection or installation of substitute equipment and the date of reconnection. This information can then be analyzed to obtain information on the relative reliability of the different parts of the system. For example, it could be determined that certain equipment requires frequent maintenance due to dusty environmental factors.

11 Future of maintenance

Many manufacturers are designing products that can be interrogated using e-support (i.e. the remote maintenance of the functional aspects of the CCTV system can be undertaken over standard telephone lines from the office of the contractor). Images from the remote system can be downloaded to a PC and any potential maintenance problems immediately identified. It is also possible to modify the parameters of certain items of equipment like multiplexers by remote.

However, this capability does not remove the need to provide adequate preventative (servicing) maintenance requirements of the CCTV system at the actual site of the installation – for obvious reasons. Cleaning of camera lenses and monitor screens, inspection of cables, connections and mechanical fixings, etc., servicing of VCRs and the visual and functional check of the complete system cannot be carried out by remote and will still need to be undertaken.